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APPLICANT(S): Hajime Inoue, et al.

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INVENTION: NEAR VIDEO-ON-DEMAND SIGNAL RECEIVER

CERTIFIED TRANSLATION

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

Yuka NAKAMURA residing at c/o SUGIURA PATENT OFFICE,  
7th floor, Ikebukuro Park Bldg., 49-7, Minami Ikebukuro  
2-chome, Toshima-ku, Tokyo, JAPAN, declares:

- (1) that she knows well both the Japanese and English languages;
- (2) that she translated Japanese Patent Application No. HEI 06-230281 from Japanese to English;
- (3) that the attached English translation is a true and correct translation of the above-identified Japanese Application to the best of her knowledge and belief; and
- (4) that all statements made of her own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements are made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 USC 1001, and that such false statements may jeopardize the validity of the application or any patent issuing thereon.

May 31, 2006

Date

Yuka Nakamura

Yuka NAKAMURA

【title of Document】	Application for Patent
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【title of the Invention】	Program Reproducing Apparatus For Use With Near Video-On-Demand System
【Number of Claim(s)】	5
【Inventor】	
【Domicile or Residence】	c/o SONY CORPORATION 7-35, Kitashinagawa 6-chome, Shinagawa-ku, Tokyo, Japan
【Name】	Hajime INOUE
【Inventor】	
【Domicile or Residence】	c/o SONY CORPORATION 7-35, Kitashinagawa 6-chome, Shinagawa-ku, Tokyo, Japan
【Name】	Yukio KUBOTA
【Inventor】	
【Domicile or Residence】	c/o SONY CORPORATION 7-35, Kitashinagawa 6-chome, Shinagawa-ku, Tokyo, Japan
【Name】	Toshimichi NAGASHIMA
【Inventor】	
【Domicile or Residence】	c/o SONY CORPORATION 7-35, Kitashinagawa 6-chome, Shinagawa-ku, Tokyo, Japan

06-230281

{name}	Akira SHIMAZU
{nventor}	
{Domicile or Residence}	c/o SONY CORPORATION 7-35, Kitashinagawa 6-chome, Shinagawa-ku, Tokyo, Japan
{name}	Keiji KANOTA
{pplicant}	
{D Number}	000002185
{name}	SONY CORPORATION
{representative}	Norio OHGA
{gent}	
{D number}	100082762
{patent Attorney}	
{name}	Masatomo SUGIURA
{telephone number}	03-3980-0339
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[Title of Document] Specification

[Title of the Invention] Program Reproducing Apparatus  
For Use With Near Video-On-  
Demand System

[Scope of Claims for a Patent]

[Claim 1]

A program reproducing apparatus for use with a new video-on-demand system for transmitting the same program at predetermined time intervals, comprising:

selecting means for selecting a channel of which a program can be reproduced in minimum waiting time when a reproduction start command is issued;

memory means for simultaneously writing and reading data; and

control means for storing part of the program from a first position at which a pause operation is started to a second position at which predetermined time elapses from the first position, for reading the content of the program stored in said memory means from the first position to the second position, for writing part of the program from a third position in the vicinity of the second position to a fourth position at which predetermined time elapses from the third position, and for repeating the read operation and the write operation so as to control said memory means.

[Claim 2]

A program reproducing apparatus for use with a new video-on-demand system for transmitting the same program at predetermined time intervals, comprising:

selecting means for selecting a channel of which a program can be reproduced in minimum waiting time when a reproduction start command is issued;

memory means for simultaneously writing and reading data; and

control means for storing part of the program from a first position at the beginning of the program to a second position at which predetermined time elapses from the first position before the program is reproduced, for reading the content of the program stored in said memory means from the first position to the second position after the program is reproduced, for writing part of the program from a third position in the vicinity of the second position to a fourth position at which predetermined time elapses after the third position, and for repeating the read operation and the write operation so as to control said memory means.

[Claim 3]

The program reproducing apparatus as set forth in claim 1 or 2, wherein said memory means is a hard disk drive.

[Claim 4]

The program reproducing apparatus as set forth in claim 1 or 2, wherein said memory means is adapted for storing selected program data in the format of received data.

[Claim 5]

The program reproducing apparatus as set forth in claim 2, wherein a predetermined time interval of the program stored before the program is reproduced is nearly equal to each of the time intervals of the program that is transmitted.

[Detailed Description of the Invention]

[0001]

[Industrial Field of Utilization]

The present invention relates to a program reproducing apparatus for use with a CATV terminal of for example a near video-on-demand system (time interval transmitting service).

[0002]

[Prior Art]

Conventionally, analog video/audio signals are transmitted from broadcasting stations. In recent years, as digital technologies advance, digital signals are transmitted from some broadcasting stations. In addition, with advancement of data compressing technologies such as MPEG, signals on around 10 channels can be transmitted with a transmission band on one existing analog channel.

[0003]

In digital CATV systems that employ data compressing technologies, a service called near video-on-demand that transmits programs at time intervals has been studied. In the near video-on-demand system, the same programs are transmitted at predetermined time intervals on a plurality of channels. Thus, the subscriber (user) of the system can see a desired movie with waiting time of at most the time interval.

[0004]

[Subject that the Invention is to solve]

In the near video-on-demand service, while the user is seeing a movie, he cannot temporarily stop seeing it. If he stops seeing the movie, he should see it from the beginning or look for the rest of the same movie from other channels.

[0005]

In the near video-on-demand service, after the user inputs a reproduction start command, he should wait for several minutes to see a desired movie.

[0006]

Therefore, an object of the present invention is to provide a program reproducing apparatus that allows the user to temporarily stop reproducing a program that is transmitted at time intervals and see the rest of the movie

after that.

[0007]

Another object of the present invention is to provide a program reproducing apparatus that can reproduce a program in a near video-on-demand service without waiting time.

[0008]

[Means for Solving the Problem]

The invention of claim 1 is a program reproducing apparatus for use with a new video-on-demand system for transmitting the same program at predetermined time intervals, comprising a selecting means for selecting a channel of which a program can be reproduced in minimum waiting time when a reproduction start command is issued, a memory means for simultaneously writing and reading data, and a control means for storing part of the program from a first position at which a pause operation is started to a second position at which predetermined time elapses from the first position, for reading the content of the program stored in the memory means from the first position to the second position, for writing part of the program from a third position in the vicinity of the second position to a fourth position at which predetermined time elapses from the third position, and for repeating the read operation and the write operation so as to control the memory means.

[0009]

The invention of claim 2 is a program reproducing apparatus for use with a new video-on-demand system for transmitting the same program at predetermined time intervals, comprising a selecting means for selecting a channel of which a program can be reproduced in minimum waiting time when a reproduction start command is issued, a memory means for simultaneously writing and reading data,

and a control means for storing part of the program from a first position at the beginning of the program to a second position at which predetermined time elapses from the first position before the program is reproduced, for reading the content of the program stored in the memory means from the first position to the second position after the program is reproduced, for writing part of the program from a third position in the vicinity of the second position to a fourth position at which predetermined time elapses after the third position, and for repeating the read operation and the write operation so as to control the memory means.

[0010]

[Operation]

After a pause command is issued until predetermined time elapses, program data is written to the memory means. When a pause cancel command is issued, the program data stored in the memory means is read. Thus, the user can see the rest of the program that was transmitted after the pause command was issued. While the program data is being read, the next data is searched and written to the memory means. These operations are repeated.

[0011]

Part of a program at a predetermined time interval to the existing program that the user is seeing is stored from the beginning. When a reproduction start command is issued, the beginning portion of the program stored is read. Thus, the program can be reproduced without waiting time.

[0012]

[Embodiment]

Next, with reference to the accompanying drawings, an embodiment of the present invention will be described. Fig. 1 shows a construction of a terminal device for use with a near video-on-demand system. Reference numeral 1

represents a tuner. The tuner 1 selects a desired channel of broadcast signals transmitted from a head end through a cable. For example, the transmission rate per channel is 24.5 Mbps or more. The same video information on seven channels compressed to a rate of 3.5 Mbps is transmitted. When the running time of a movie program is two hours, since  $(120 \text{ minutes} \div 7 \div 17 \text{ minutes})$ , the time intervals of channels are 17 minutes.

[0013]

A signal selected by the tuner 1 is demodulated by a demodulator 2. The demodulated signal is error-detected and error-corrected by an error correcting circuit 3. Thus, an error that takes place on the transmission path is corrected. The error-corrected signal is supplied to a demultiplexer 4. The demultiplexer 4 selects a desired one of a plurality of programs. To do that, a control signal generated in a microcomputer 9 is supplied to the demultiplexer 4. Signals that pass through a man-machine interface such as a keyboard or a mouse are supplied to the microcomputer 9. In other words, a command for reproducing a desired program is input to the microcomputer 9. Data on a channel that is closest to the beginning of the program is selected by the demultiplexer 4 (actually, since delay time is considered, data on a channel that is close to the end of the program is selected).

[0014]

Before the reproduction start command is issued, a desired one of various programs provided by the near video-on-demand service is selected by the man-machine interface and the microcomputer 9. For example, categories (for example, movies and shopping information) of programs provided are displayed on a CRT display (not shown) connected to the microcomputer 9. With a key operation or a mouse

operation, one of the categories is selected. For example, when the movie category is selected, movie titles that are provided are displayed. When one of the movie tiles is selected, a preview of the selected movie is displayed for a short time. At this point, the user should determine whether or not to see the movie. When the user determines to see the movie, the microcomputer 9 issues the reproduction start command.

[0015]

An output signal selected by the demultiplexer 4 is supplied to one input terminal 6a of a switch circuit 5. A buffer 7 is connected to the switch circuit 5. An MPEG decoder 8 is connected to the buffer 7. It should be noted that compressing code other than MPEG can be used. Decoded data of the MPEG decoder 8 is supplied to the monitor through a baseband process circuit (not shown). The monitor displays reproduced image data.

[0016]

The error-corrected data that is output from the error correcting circuit 3 is supplied to a program selector 10 and a selector controller 11. The program selector 10 and the selector controller 11 select a program to be stored to a hard disk drive 12 that is a recording device. An output signal of the microcomputer 9 is supplied to the selector controller 11. The selector controller 11 generates a control signal for selecting the program designated by the program selector 10.

[0017]

The hard disk drive 12 comprises a recording processor 13, a buffer 14, a head and disk 15, a buffer 16, a reproducing processor 17, and a controller 18. The recording processor 13 performs a write operation for the data selected by the program selector 10. The buffer 14

is connected to the recording processor 13. The head writes data received from the buffer 14 to the disk. The buffer 16 stores the data read from the disk. The reproducing processor 17 is connected to the buffer 16. The controller 18 controls the read/write operations. The controller 18 and the microcomputer 9 are connected. The operation of the hard disk drive 12 can be controlled by the microcomputer 9. The construction of the hard disk drive 12 can be the same as that of a conventional hard disk drive.

[0018]

Reproduced data that is output from the hard disk drive 12 is supplied to an input terminal 6b of the switch circuit 5. As described above, the buffer 7 and the MPEG decoder 8 are connected to the switch circuit 5. Thus, the reproduced data of the hard disk drive 12 can be displayed on the monitor. The switch circuit 5 is controlled by the microcomputer 9 corresponding to a command such as a pause command that is input by the user.

[0019]

According to the embodiment of the present invention, since the hard disk drive 12 is provided in the terminal device of the near video-on-demand system, a so-called pause operation can be performed. In the pause operation, a program being received is temporarily stopped and thereafter resumed from the rest thereof. Next, with reference to Fig. 2, the pause operation will be described.

[0020]

Fig. 2A shows an example in the case that seven channels (channels 1 to 7) are used for one existing analog channel and a 120 minute movie program is transmitted at predetermined time intervals ( $120 \div 7 \doteq 17$  minutes). Time sequences of seven channels are arranged on the same time axis. The hard disk drive 12 has the storage capacity for

the data at the time intervals. In Fig. 2A, "a" represents the top of the program and "b" represents the end of the program. On each channel, the same program is repeated twice. However, the drawing only shows part of long time (for example, one day).

[0021]

When the user issues a receive request at time (A), a channel that is later than time (A) and closest to the start time (in Fig. 2A, channel 4) is selected by the demultiplexer 4. The user should wait until the program on channel 4 is started (for example five minutes).

[0022]

Next, with reference to Fig. 2B, the case that the user issues a pause command while he is seeing the program on channel 4 will be described. At time  $p_0$ , the user inputs the pause command. The user has seen the content (positions a to c) of the program at time  $p_0$ . When the pause command is input, the hard disk drive 12 starts recording the data of the program from this time. If the pose interval exceeds 17 minutes, the hard disk drive 12 records the data for 17 minutes (positions c to d) and then stops recording it.

[0023]

At time  $xp_0$  after predetermined time elapses, the user inputs a pause-off command. The pause-off command is sent to the microcomputer 9. The microcomputer 9 controls the switch circuit 5 and the hard disk drive 12. The hard disk drive 12 reproduces the data for 17 minutes (positions c to d). The reproduced data is supplied from the hard disk drive 12 to the buffer 7 through the switch circuit 5. Thus, the user can see the rest of the program that was transmitted after the pose-on operation was performed (positions c to d).

[0024]

While the data is being read from the hard disk drive 12, data that is later than time  $x_{p_0}$  at which the pause-off operation was performed and closest thereto (namely, data for 17 minutes after position d) is searched and written to the hard disk drive 12. In the example shown in Fig. 2B, the region of (positions d to e) of the program on channel 5 is written to the hard disk drive 12. After the data of (positions c to d) is read, data of (positions d to e) is read. Thus, the hard disk drive 12 simultaneously performs read and write operations. In reality, the read operation and the write operation are performed by the buffers 14 and 16 of the hard disk drive 12 on time division basis.

[0025]

Thereafter, data is repeatedly written to and read from the hard disk drive 12. Thus, after the pause-off operation is performed, the user can see the program corresponding to the data read from the hard disk drive 12. The write operation and the read operation are repeated when the reproduction operation is stopped or until the end of the program. The positions (c, d, and so forth) of the program of the received data can be detected corresponding to time code or the like that synchronizes with the data of the program on each channel. Alternatively, with the difference between the time interval of each channel (in this example, 17 minutes) and the time interval after the pause-on operation is performed until the pause-off operation is performed, the channel on which the next point takes place can be calculated. As another alternative method, when data after the pause-on operation is performed is stored, an overlap portion may be provided to some extent.

[0026]

Next, with reference to Fig. 3, the case that the

interval after the pause-on operation is performed to the pause-off operation is performed is shorter than 17 minutes will be described. Fig. 3A shows received data on seven channels corresponding to one analog channel as with the case shown in Fig. 2A. While a program on channel 4 is being received and reproduced, the pause-on operation is performed at time  $p_0$ . As with the case shown in Fig. 2, the hard disk drive 12 starts recording the data on channel 4 for 17 minutes (positions c to d) after time  $p_0$ .

[0027]

At time  $x_{p_0}$  before 17 minutes have not elapsed from  $p_0$ , the pause-off operation is performed. After time  $x_{p_0}$  at which the pause-off is performed, the hard disk drive 12 starts reading the data. At this point, the hard disk drive 12 is still performing the write operation. When the hard disk drive 12 has read the data of the region of (positions c to d), it reads the next data for 17 minutes. The write operation and the read operation are repeated. Thus, the user can see the reproduced data supplied from the hard disk drive 12.

[0028]

After the pause-on operation is performed and then the pause-off operation is performed within 17 minutes, if the pause operation is not performed, with only the received data on channel 4, the entire program can be reproduced. However, if the pause operation is performed at short intervals several times and the total of the pause intervals exceeds 17 minutes, data on another channel should be used.

[0029]

Next, with reference to Fig. 4, another embodiment of the present invention will be described. The system construction of the embodiment shown in Fig. 4 is the same as that of the embodiment shown in Fig. 1. By changing the

control operation of the microcomputer 9, the other embodiment can be accomplished. In this embodiment, when the near video-on-demand service is received, a program can be reproduced at any time. As with the case shown in Figs. 2A and 3A, Fig. 4A shows the case that the same program is transmitted at time intervals of 17 minutes.

[0030]

Before the near video-on-demand service is received (for example, at midnight of the previous day), data of first 17 minutes of the program (positions a to e) is written to the hard disk drive 12. In Fig. 4, when a reproduction start command is input at time A, the hard disk drive 12 starts reading data. The read data of the hard disk drive 12 is supplied to the buffer 7 through the switch circuit 5. Thus, the user can see the reproduced image data without waiting time. The image data (positions a to e) for 17 minutes from the beginning of the program is read from the hard disk drive 12.

[0031]

While the data is being read from the hard disk drive 12, the rest of the program is searched from channels 1 to 7. While the data is being read, the rest of the program is written to the hard disk drive 12. In the example shown in Fig. 4, the data on channel 3 (position e to position 17 minutes later) is written to the hard disk drive 12. Thereafter, until the end position (b) of the program is detected or the reproduction stop command is input, the write operation and the read operation are repeated. As with the embodiment shown in Fig. 1, the read data of the hard disk drive 12 is displayed on the monitor.

[0032]

In the above-described embodiments, the hard disk drive is used as a memory. However, it should be noted that

the memory is not limited to the hard disk drive. Instead, a semiconductor memory that can simultaneously read and write data, a writable optical disc, or the like can be used.

[0033]

#### [Effects of the Invention]

According to the present invention, when a near video-on-demand service is used, the reproduction of a program can be stopped in the middle and resumed from the rest of the program. In addition, after a reproduction start command is input, the user can see a desired program without waiting time.

#### [Brief Description of the Drawings]

[Fig. 1]

Block diagram showing a construction of an embodiment of the present invention.

[Fig. 2]

Schematic diagram for explaining an operation of the embodiment of the present invention.

[Fig. 3]

Schematic diagram for explaining an operation of the embodiment of the present invention.

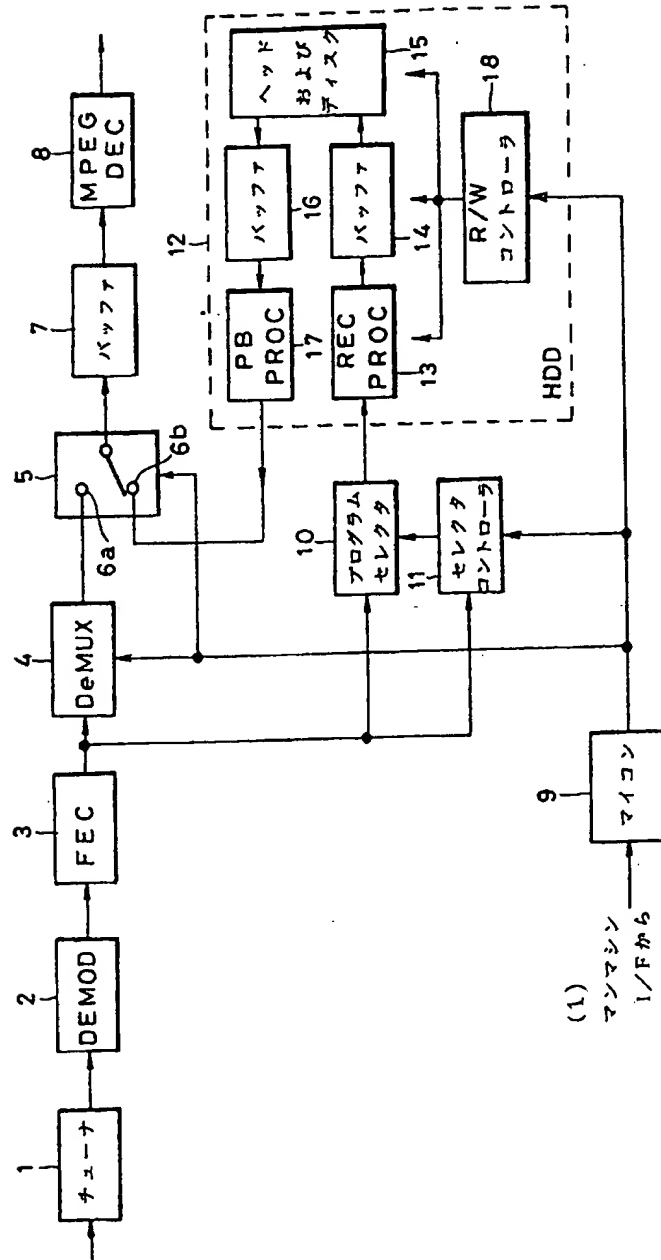
[Fig. 4]

Schematic diagram for explaining an operation of another embodiment of the present invention.

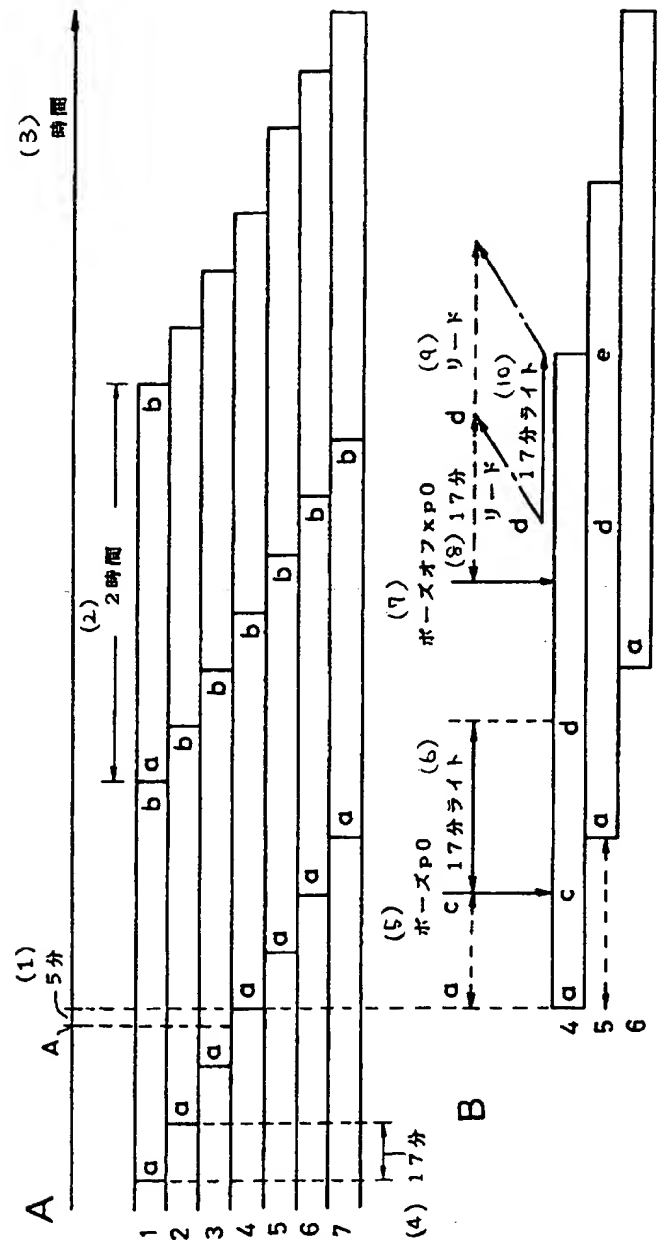
#### [Description of Reference Numerals]

- 4     Demultiplexer
- 9     Microcomputer
- 10   Program selector
- 12   Hard disk drive

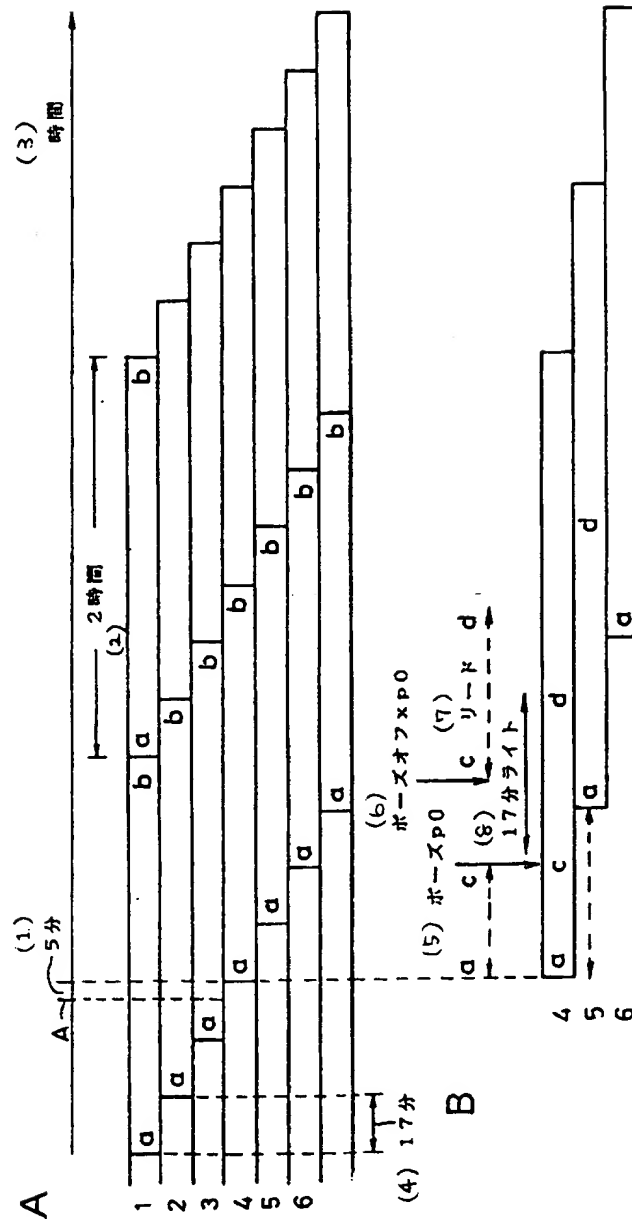
【図1】



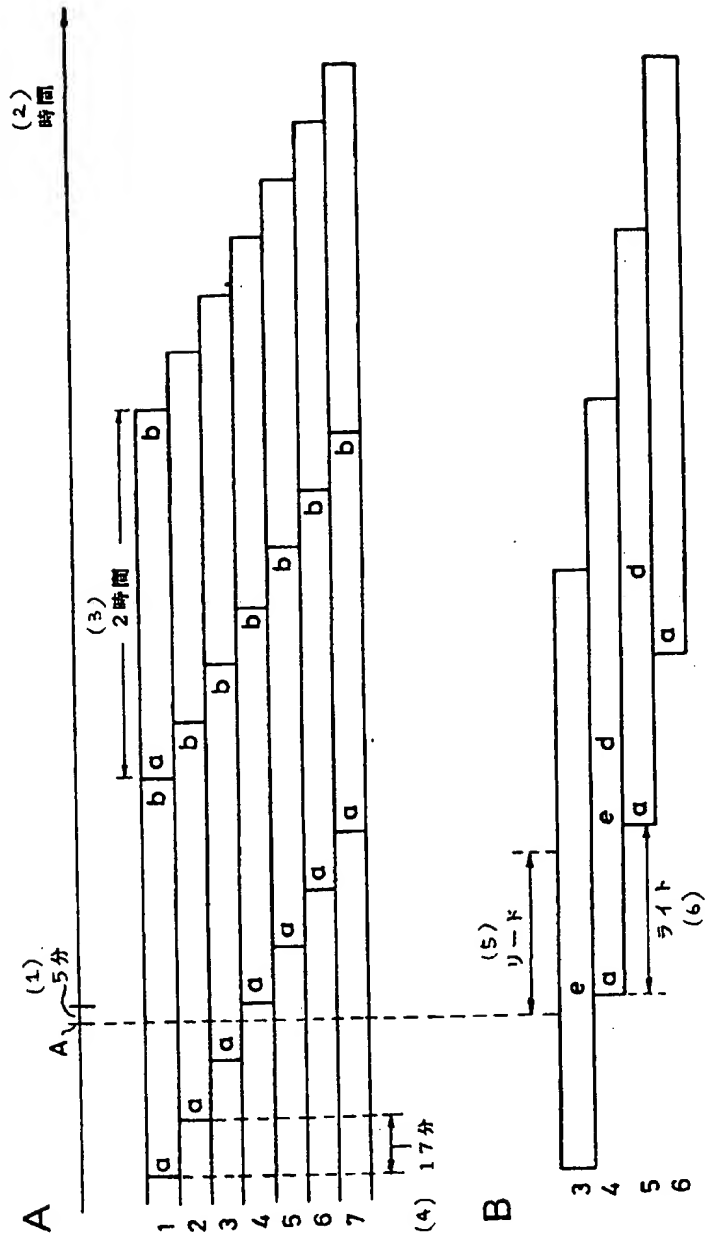
【図2】



【图3】



【図4】



[Title of Document] Drawings

[FIG. 1]

(1) ... FROM MAN-MACHINE INTERFACE

1 ... TUNER

7 ... BUFFER

9 ... MICROCOMPUTER

10 ... PROGRAM SELECTOR

11 ... SELECTOR CONTROLLER

16 ... BUFFER

14 ... BUFFER

15 ... HEAD AND DISK

18 ... R/W CONTROLLER

[FIG. 2]

(1) ... 5 MINUTES

(2) ... 2 HOURS

(3) ... TIME

(4) ... 17 MINUTES

(5) ... PAUSE  $p_0$

(6) ... WRITE FOR 17 MINUTES

(7) ... PAUSE-OFF  $x_{p_0}$

(8) ... READ FOR 17 MINUTES

(9) ... READ

(10) ... WRITE FOR 17 MINUTES

[FIG. 3]

(1) ... 5 MINUTES

(2) ... 2 HOURS

- (3) ... TIME
- (4) ... 17 MINUTES
- (5) ... PAUSE  $p_0$
- (6) ... PAUSE-OFF  $x_{p_0}$
- (7) ... READ
- (8) ... WRITE FOR 17 MINUTES

[FIG. 4]

- (1) ... 5 MINUTES
- (2) ... TIME
- (3) ... 2 HOURS
- (4) ... 17 MINUTES
- (5) ... READ
- (6) ... WRITE

[Title of Document] Abstract

[Abstract]

[Purpose]

To allow a pause operation to be performed in a near video-on-demand service and a desired program to be reproduced without waiting time.

[Construction]

When a microcomputer 9 receives a pause-on command, received data for a predetermined time interval is written to a hard disk drive 12. When a pause-off operation is performed, the received data is read from the hard disk drive 12. In addition, the rest of the data transmitted after the pause-on operation was performed is searched. The rest of the data is written while data is being read. When data for a predetermined time interval transmitted after the pause-on operation was performed has been read, the written data is read while the next data is being written. By repeating these operations, the pause operation can be used. The top portion of the program is prewritten to the hard disk drive. When the reproduction start command is input, the data can be read without waiting time.

[Selected Drawing] Fig. 1

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【corrected Document】	Application for Patent

<Authorized Information Added Information>

【Applicant of Patent】

【D Number】	000002185
【Domicile or Residence】	7-35, Kitashinagawa 6-chome, Shinagawa-ku, Tokyo, Japan
【Name】	SONY CORPORATION

【Agent】

	Applicant
【D Number】	100082762
【Domicile or Residence】	SUGIURA PATENT OFFICE #420, 25 Sankyo Bldg., 48-10, Higashi Ikebukuro 1-chome, Toshima-ku, Tokyo
【Name】	Masatomo SUGIURA